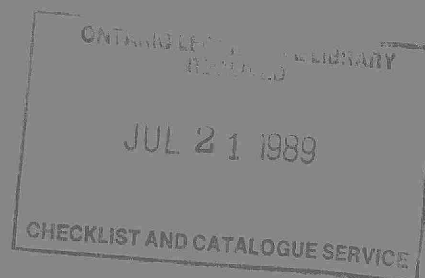


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SNOW SAMPLING SURVEY
IN THE VICINITY OF
TWO MINERAL ASSAY LABORATORIES
IN THE
RED LAKE AREA
1988

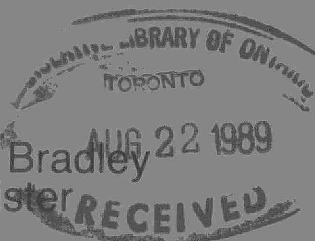


JUNE 1989



Environment
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Jim Bradley
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SNOW SAMPLING SURVEY
IN THE VICINITY OF
TWO MINERAL ASSAY LABORATORIES
IN THE RED LAKE AREA,
1988

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TECHNICAL SUPPORT SECTION
NORTHWESTERN REGION

JUNE 1989



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INTRODUCTION

Mineral assay laboratories in Red lake and Cochenour perform approximately 600 fire assays per day. The assays are done mainly in support of gold mining and exploration work in the area. During the analytical process, about 0.4 grams of lead per sample are unaccounted for and presumed lost to the atmosphere. Firing of the samples in high temperature furnaces volatilizes lead and raises concerns about possible contamination of the environment and health risks to nearby residents.

In response to a complaint from a Red Lake resident, the Ministry of the Environment conducted a snow survey near Accurassay Laboratories Ltd. Since Paul's Custom Fire Assaying Ltd. operates a similar facility in Cochenour, snow sampling was also conducted there. Both surveys were carried out in early March, 1988.

METHODS

Snow samples were collected on March 1-2, 1988 from 14 sites (Figure 1) near Accurassay Laboratories Ltd. At Paul's Custom Fire Assaying Ltd. in Cochenour, snow samples were obtained on March 2, 1988 from 13 sites (Figure 2). Samples were also collected from two control sites, to determine background levels of contaminants.

Single samples of snow were collected using a clear acrylic cylinder (15.25 centimetres inside diameter). Core samples of the complete snow profile were obtained by inserting the cylinder to ground level and manually clearing snow from around one side of the cylinder. The cylinder was then lifted about 5 to 10 centimetres off the ground and a clean plastic shovel inserted under its base. The cylinder was raised from the ground and the collected snow was transferred to a clean, heavy-gauge polyethylene bag for retention in unmelted condition until ready for processing. The number of

cores obtained from each site was recorded, as well as the total depth of snow, depth of fresh snow, and the kind and amount of visible contaminants. Just prior to melting, sample material was transferred to clean, polyethylene bags in the laboratory. The snow-filled bags were sealed, placed in clean plastic pails, and melting proceeded at normal indoor temperatures. After the samples had melted, the bags were shaken to ensure uniform distribution of particulate matter in the meltwater. The contents of each bag were poured into a graduated 4-litre beaker and the meltwater volume was recorded to the nearest 100 ml (millilitres). A 500 ml portion of each sample was then poured into two, 500 ml plastic bottles. The contents of one bottle was preserved with nitric acid for lead analysis; the fraction in the other bottle was untreated and was used for conductivity and pH determination. All analyses were performed at the Ministry's Thunder Bay laboratory.

Ministry contaminant guidelines for snow are used in this report. Their exceedence would suggest that contamination may be present, but would not necessarily imply adverse effects.

RESULTS AND DISCUSSION

ACCURASSAY LABORATORIES LTD.

A trace of grey particulate matter was observed on the snow surface at site 10. No visible contamination was noted in samples from other sites. Snow meltwater results are presented in Table 1. Levels of lead near Accurassay were elevated and exceeded Ministry guidelines at four locations. Two of these exceedences occurred off Accurassay property. Lead levels in snow were highest near the laboratory building and decreased rapidly with increasing distance from Accurassay (see Figure 3). Conductivity and pH followed a similar distribution pattern.

Statistical analysis (Table 2) showed a significant negative correlation between distance from the centre of the Accurassay Laboratory and lead concentrations at individual sampling sites. A similar correlation existed for pH. These correlations imply that Accurassay was the source of elevated lead and pH in snow.

On February 27, 1988, Accurassay performed their own snow sampling survey. Although their sampling methods differed from ours, they reported a similar trend for lead (Figure 4). The lead levels were usually higher than ours because they sampled only surface snow just prior to a fall of fresh snow. Approximately 20 cm of snow fell on March 1, 1988, just before the Ministry survey was conducted.

PAUL'S CUSTOM FIRE ASSAYING LTD.

Snow meltwater results are presented in Table 3. The lead guideline for snow was exceeded at two locations on company property. Lead in snow was near expected background levels in adjacent residential areas. Lead concentrations were highest near the assay laboratory and decreased as distance from this location increased (Figure 5). There was a similar distribution pattern for pH.

Data analysis (Table 3) showed a strong correlation between lead and pH. Also, there were significant negative correlations between distance from the source and levels of lead in snow, and between distance and pH levels in snow. These relationships support the observed distribution patterns of lead (Figure 5) and pH.

CONCLUSIONS

Mineral assay laboratories in Red Lake and Cochenour are sources of airborne lead. Snow contaminant guidelines were significantly exceeded on company property, and were slightly exceeded at off-property sites near Accurassay Laboratories in Red Lake. Lead levels in snow off company property were normal around Paul's Custom Fire Assaying in Cochenour.

At the time of our survey, Accurassay Laboratories used an unproven control device in their furnace stack to control lead emissions. Paul's Custom Fire Assaying Ltd. had no emission controls. Even though Accurassay processed samples at twice the rate at Paul's Custom facility, levels of lead at similar distances from the two sources were the same. Therefore, the fiberglass insulation plug in Accurassay's furnace stack probably removed some of the airborne lead.

Rock dust was present on the snow surface near the southwest corner of the Accurassay laboratory. The dust originates from ore sample preparation in the grinding room. A heavy coating of dust was also observed on nearby tree foliage in the same area in August, 1988. This situation was not observed at the Cochenour laboratory.

RECOMMENDATIONS

1. The Ministry, Accurassay Laboratories Ltd. and Paul's Custom Fire Assaying Ltd. should discuss a program of corrective measures to reduce lead and dust emissions from the assay laboratories.
2. Continue air sampling with high volume sampling equipment and conduct a follow-up snow sampling survey near Accurassay.

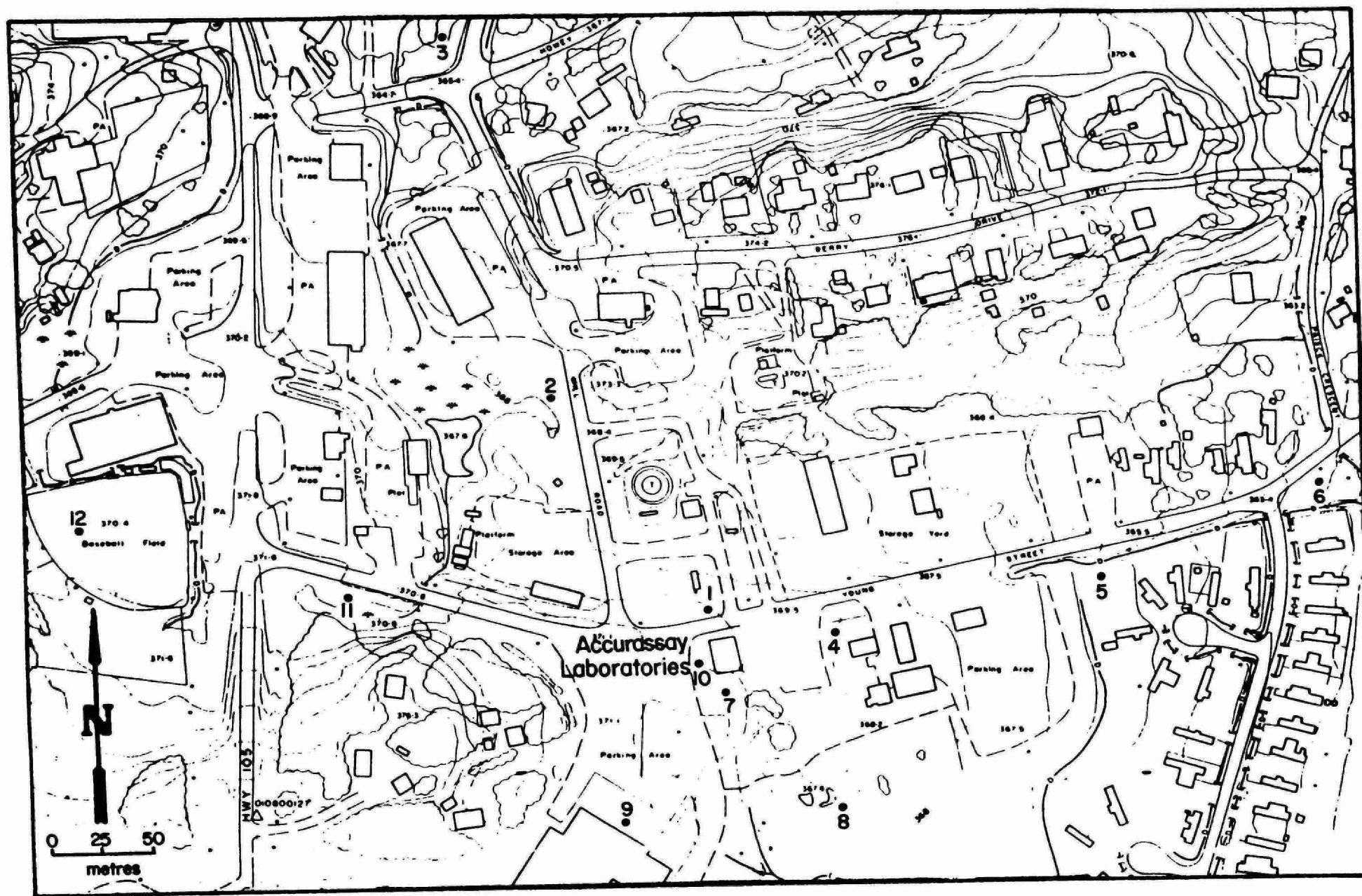


Figure 1. Snow sampling sites, Accurassay Laboratories Ltd., Red Lake, March 1-2, 1988.

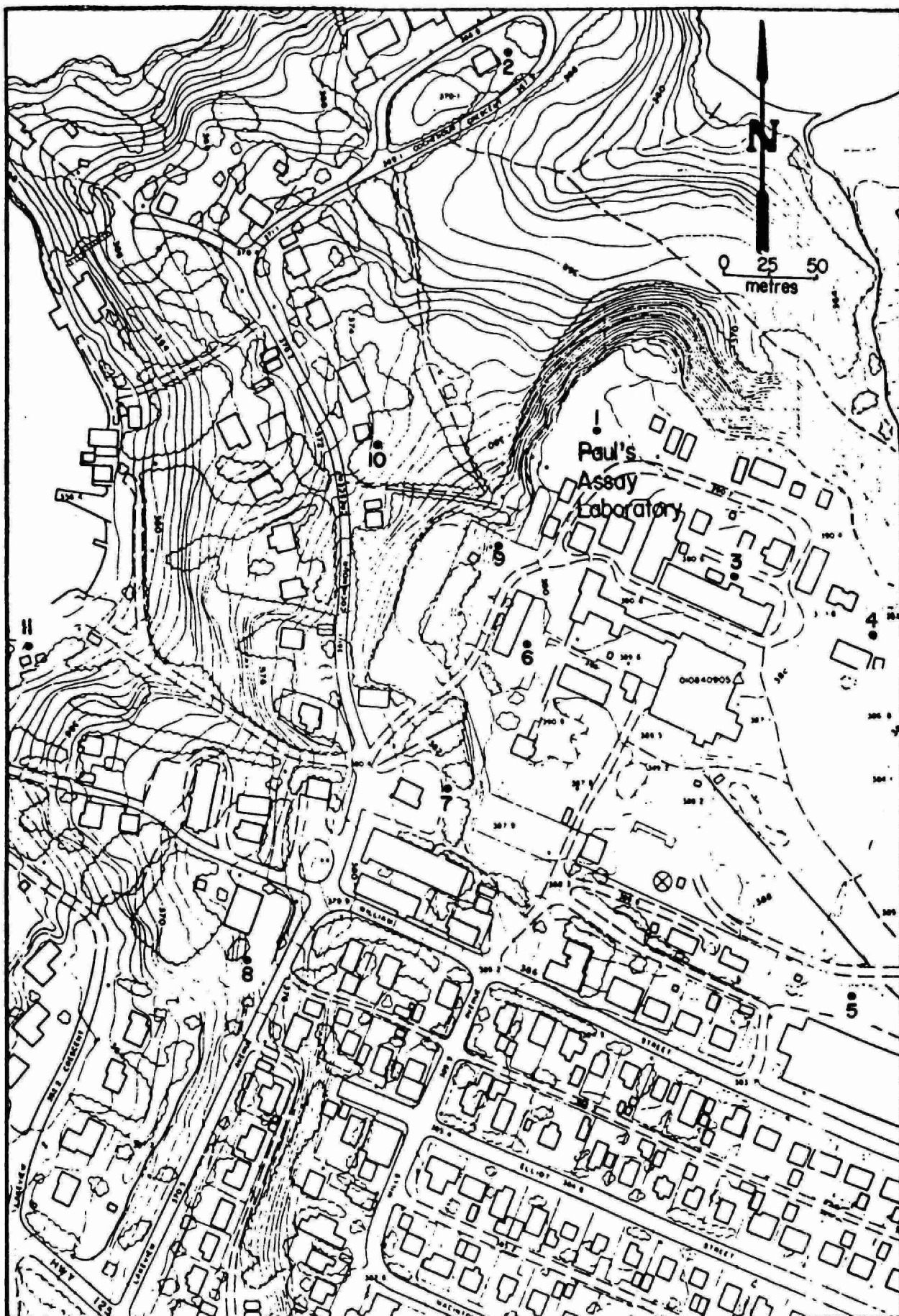


Figure 2. Snow sampling sites, Paul's Custom Fire Assaying Ltd., Cochenour, March 2, 1988.

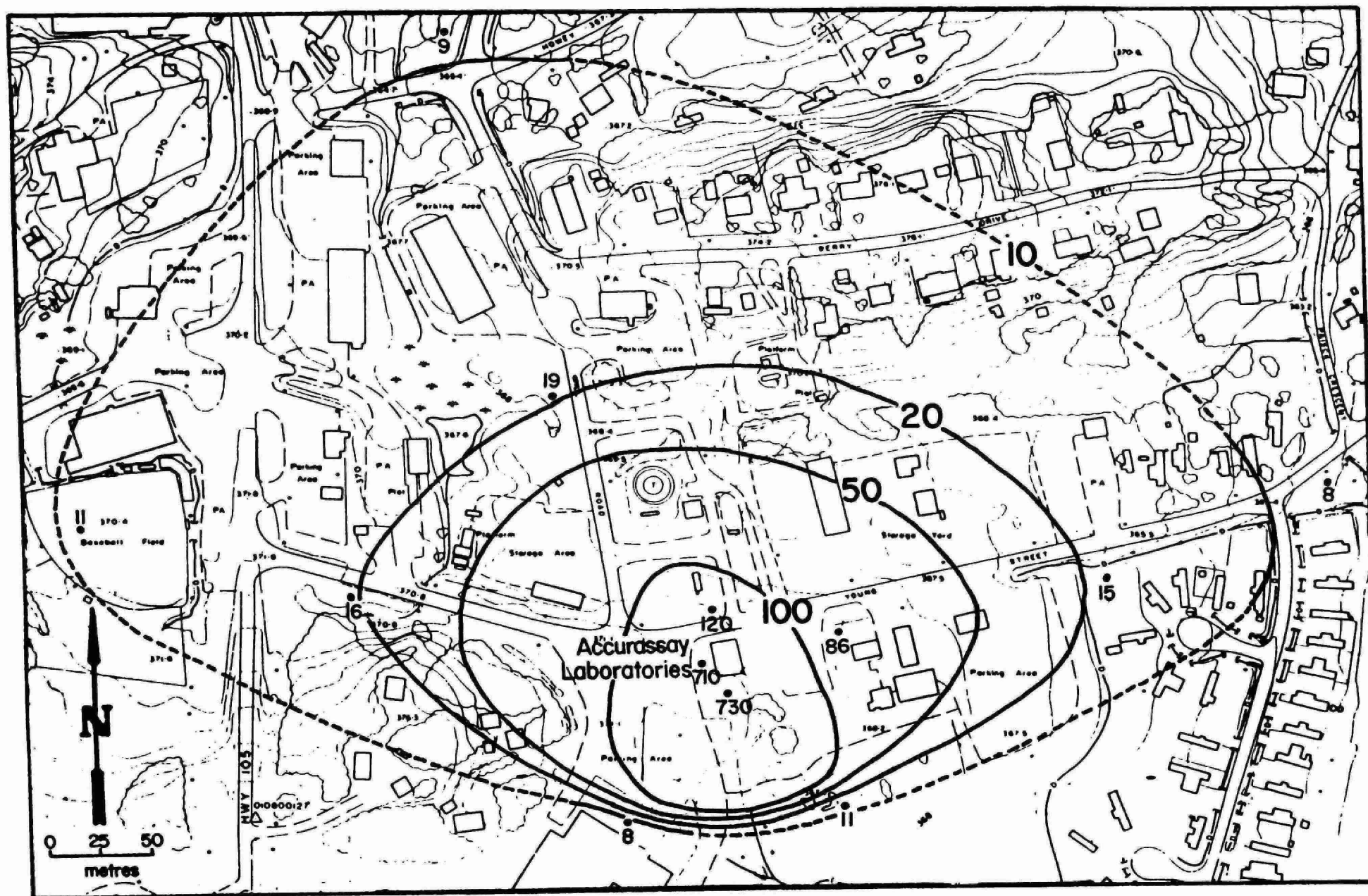


Figure 3. Levels of lead ($\mu\text{g/l}$) in snow, Accurassay Laboratories Ltd., Red Lake, March 1-2, 1988.

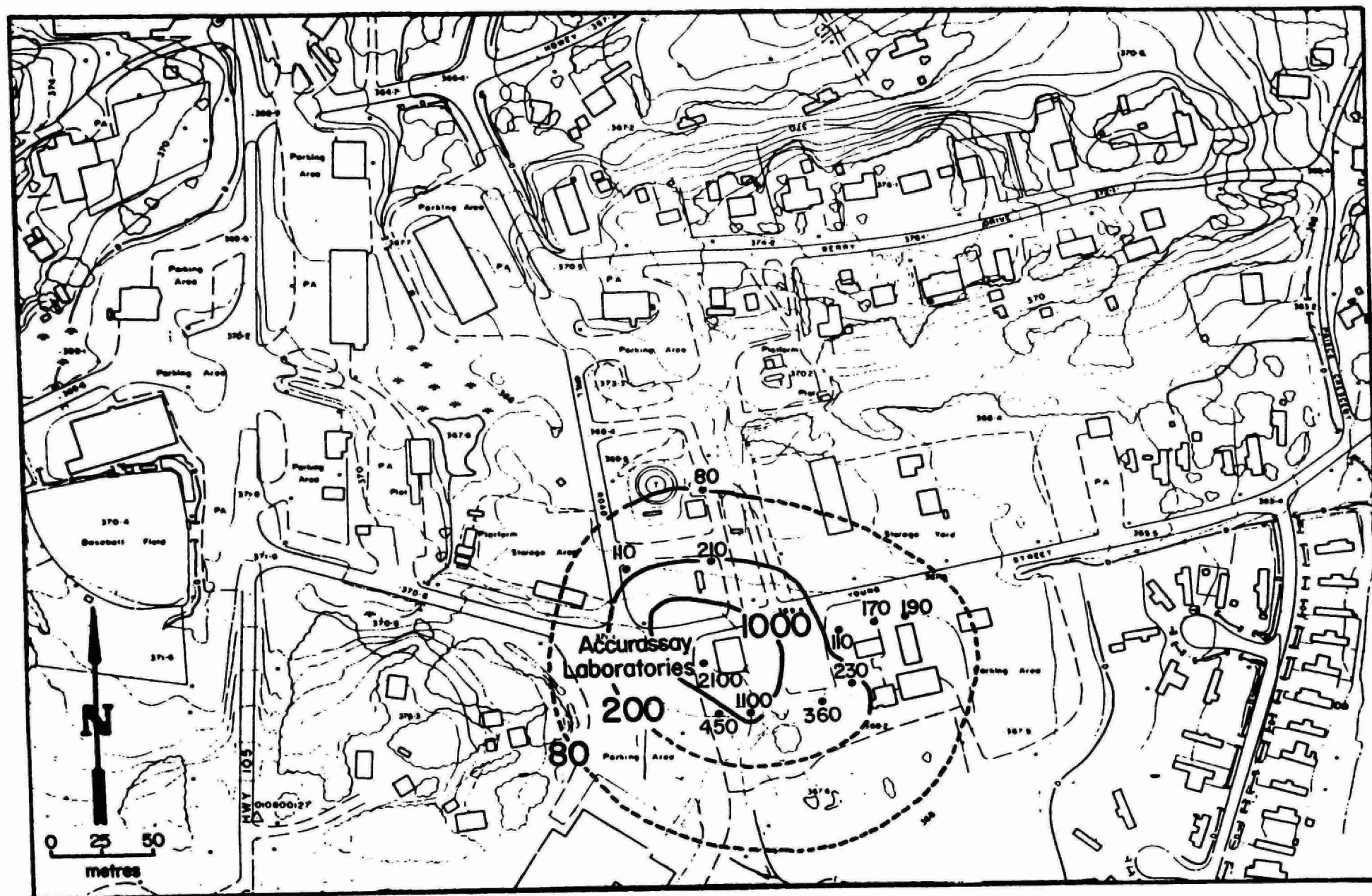


Figure 4: Levels of lead ($\mu\text{g/l}$) in snow, Accurassay Laboratories Ltd., Red Lake, February 27, 1988.

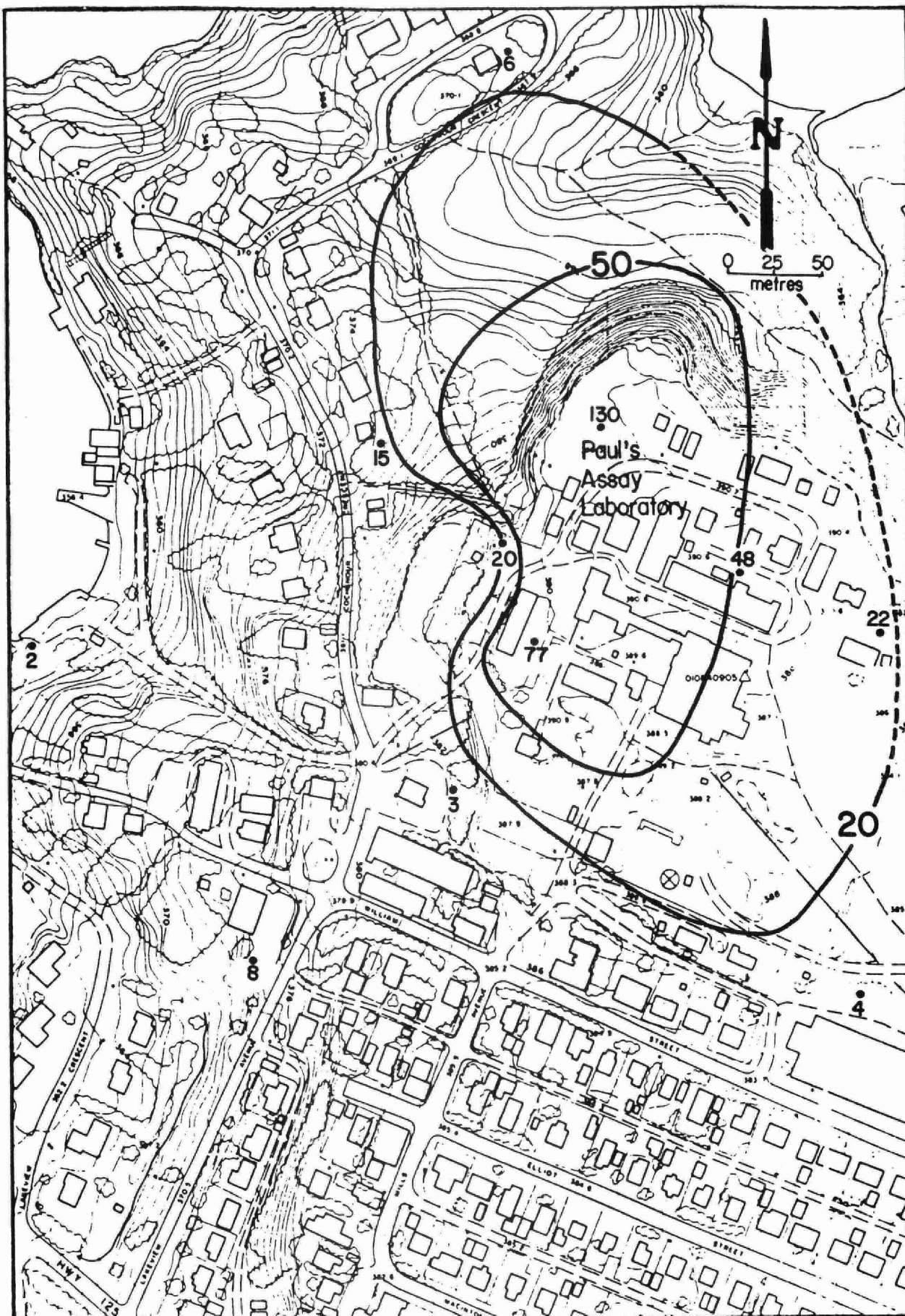


Figure 5. Levels of lead ($\mu\text{g/l}$) in snow, Paul's Custom Fire Assaying Ltd., Cochenour, March 2, 1988.

TABLE 1. Levels of lead (ug/l), conductivity (μ mhos), and pH in snow meltwater collected near Accurassay Laboratories Ltd., Red Lake, March 1, 1988.

Station	Distance ³	Lead	Conductivity	pH
1	25	120	24	5.9
2	158	19	15	4.9
3	345	9	13	5.0
4	58	86	25	5.8
5	195	15	12	5.3
6	312	8	9	5.1
7 ¹	18	730	21	6.9
8	95	11	11	4.9
9	95	8	23	5.0
10 ¹	12	710	30	7.3
11	188	16	32	5.1
12	325	11	22	5.0
Controls ²		2	12	4.8
Contaminant guidelines		50	45	

¹Sites on company property.

²Average of two sampling sites.

³Distance (in metres) from centre of Accurassay Laboratories Ltd. to sampling sites.

TABLE 2. Correlation matrix of selected parameters in snow meltwater collected near Accurassay Laboratories Ltd., Red Lake, March 1-2, 1988.

	Lead	Conductivity	pH
Conductivity	.39		
pH	.95*	.49	
Distance ¹	-.59*	-.48	-.66*

*Denotes a significant Pearson correlation at the 95% confidence level.

¹Distance from the centre of Accurassay building to sampling sites.

TABLE 3. Levels of lead (ug/g), conductivity (μ mhos), and pH in snow meltwater collected near Paul's Custom Fire Assaying Ltd., Cochenour, March 2, 1988

Station	Distance ³	Lead	Conductivity	pH
1 ¹	58	130	11	6.5
2	267	6	9	5.0
3 ¹	86	48	15	6.8
4 ¹	172	22	11	6.4
5	294	4	9	5.2
6 ¹	64	77	20	6.5
7	158	3	11	5.7
8	294	8	13	4.9
9 ¹	47	20	8	5.9
10	119	15	10	5.8
11	311	2	9	4.8
Controls ²		4	12	4.8
Contaminant guidelines		50	45	

¹ Sites on company property.

² Average of two sampling sites.

³ Distance (in metres) from centre of assaying building to sampling sites.

TABLE 4. Correlation matrix of selected parameters in snow meltwater collected near Paul's Custom Fire Assaying Ltd., Cochenour, March 2, 1988.

	Lead	Conductivity	pH
Conductivity	.46		
pH	.69*	.53	
Distance ¹	-.66*	-.37	-.89*

* Denotes a significant Pearson correlation at the 95% confidence level.

¹ Distance from centre of Paul's Custom Assaying building to sampling sites.

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